National Park Service Monitoring in the Context of Climate Change **Inventory & Monitoring Program**

Northeast and National Capital Regions National Park Service U.S. Department of the Interior



Overview

The National Park Service has implemented vital signs monitoring in 32 networks across the country to address physical resources and processes, biological attributes, and ecological processes. Five networks are located in the northeast, the Eastern Rivers and Mountains Network, Mid-Atlantic Network, National Capital Region Network, Northeast Coastal and Barrier Network, and Northeast Temperate Network. The Appalachian National Scenic Trail traverses most of the networks.

Vital Signs Monitoring

Under all modeled climate change scenarios, we expect to see a variety of changes across all Northeast and Mid-Atlantic parks. Though not established specifically to monitor ecosystem responses to climate change, vital signs monitoring will look for patterns consistent with predicted climate change effects on park ecosystems, including alterations in weather and climate patterns, changes in water quality and quantity, and long-term effects on a variety of plant and animal communities.

WEATHER AND CLIMATE

Weather and climate are dominant factors that drive physical and ecological processes. Climate change in the Northeast and Mid-Atlantic is predicted to result in increased summer temperatures, milder winters, variations in quantity and timing of rainfall, and increased frequency and severity of weather related disturbances such as drought. Several networks are monitoring weather and climate using data drawn from cooperative weather stations surrounding each park.



TERRESTRIAL RESOURCES

As the climate changes across the Northeast Region, we expect to see a modification in the range and distribution of plant and animal species. Altered disturbance regimes will also increase the spread of invasive exotic plants, pests, and pathogens. Examples of network monitoring include:

• Forest health metrics such as tree growth, mortality, and regeneration; understory species presence and abundance; standing and coarse woody debris.



Forest vegetation monitoring in Gettysburg National Military Park.

- Early detection of invasive exotic plant and animal species.
- Rare high elevation and riparian plant and animal communities, for example, the globally threatened Shenandoah salamander (Plethodon shenandoah).
- Tracking the presence and distribution of Louisiana waterthrush and other bird species that occur along streams in the Eastern Rivers and Mountains Network parks. Bird populations monitored in selected parks across the region.

ESTUARINE AND COASTAL RESOURCES

Sea level rise and changes in intensity and abundance of storms is increasing the threats on coastal resources in the Northeast and Mid-Atlantic regions. Examples of network monitoring include:

- Monitoring changes in marsh vegetation communities, nekton (fish and decapods) diversity and richness, soil salinity, and sediment elevation.
- Seagrass monitoring in selected coastal parks incorporates measures of estuarine nutrient enrichment.



- Monitoring amphibians in National Capital Region and Northeast Temperate parks.
- Northeast Temperate Network and partners are developing a multi-method phenology monitoring protocol. A NASA funded project will integrate remote sensing of phenology with ground-based forest monitoring plots.

AQUATIC RESOURCES

Water resources across the region range from small, cold, headwater streams to some of the largest and oldest rivers in the United States. These systems support diverse flora and fauna that are uniquely adapted to specific habitats. Climate change is expected to raise average annual water temperature and increase the incidence of extreme events, exacerbating the negative effects of current stresses on aquatic systems. Examples of network monitoring include:



Colocated bird and water quality monitoring in New River Gorge National River.

- Core water quality data (temperature, pH, dissolved oxygen, specific conductance, and discharge).
- Tracking the status and trends in fish communities, such as native brook trout (Salvelinus fontinalis) populations in Shenandoah National Park.
- Aquatic macroinvertebrates, important biological indicators of upstream conditions, in multiple networks.

- Estuarine water quality
- monitoring assesses changes in sediment organic carbon, chlorophyll a, dissolved oxygen concentration, attenuation of photosynthetically active radiation, and the required ancillary data of temperature and salinity.
- Coastal shoreline and topography mapping and monitoring is conducted in coastal parks to identify areas of "critical erosion" where park infrastructure and

Nekton sampling in Fire Island National Seashore.

natural resources are threatened by rapid increase in erosion due to factors such as increased storm intensity and frequency, and sea level-rise.

Contacts

For more information on vital signs monitoring in the region, please contact any of the following program managers:

John Karish, Northeast Region I&M Program, John_Karish@nps.gov Jim Comiskey, Mid-Atlantic Network, Jim_Comiskey@nps.gov Patrick Campbell, National Capital Region Network, J_Patrick_Campbell@nps.gov Fred Dieffenbach, Appalachian National Scenic Trail, Fred_Dieffenbach@nps.gov Matt Marshall, Eastern Rivers and Mountains Network, Matt_Marshall@nps.gov Brian Mitchell, Northeast Temperate Network, Brian_Mitchell@nps.gov Gordon Olson, Shenandoah National Park, Gordon_Olson@nps.gov Sara Stevens, Northeast Coastal and Barrier Network, Sara_Stevens@nps.gov Megan Tyrrell, Cape Cod National Seashore, Megan_Tyrrell@nps.gov

